CLAIMS

What is claimed is:

1. An apparatus for detecting neural signals emanating from inside a brain within a cranium, having a thickness, that is covered by a scalp and for transmitting the signals to an external receiver, comprising:

   a. a first conductive skull screw, capable of being implanted in the cranium and under the scalp, having a predefined length that is at least as long as the thickness of the cranium, but less than a thickness that would cause the first conductive screw to invade the brain when implanted into the cranium;

   b. a second conductive skull screw, capable of being implanted in the cranium and under the scalp, having a predefined length that is at least as long as the thickness of the cranium, but less than a thickness that would cause the second conductive screw to invade the brain when implanted into the cranium; and

   c. a transponder electrically coupled to the first conductive skull screw and to the second conductive skull screw, the transponder capable of being implanted between the cranium and the scalp, the transponder capable of detecting a differential electrical potential between the first conductive skull screw and the second conductive skull screw and generate a signal representative thereof, the transponder also capable of transmitting the signal to the external receiver.

2. The apparatus of Claim 1, wherein the transponder comprises:

   a. an amplifier that amplifies the signal;

   b. a transmitter that transmits the signal; and

   c. a power induction circuit that is capable of converting an electromagnetic signal into a current used to drive the amplifier and the transmitter.

3. The apparatus of Claim 1, wherein the first conductive skull screw and the second conductive skull screw comprise stainless steel.

4. An apparatus for detecting neural signals emanating from inside a brain within a cranium that is covered by a scalp and for transmitting the signals to a processing device, comprising:

   a. a first conductive skull screw, the first conductive skull screw capable of being implanted in the cranium and under the scalp, the first conductive skull screw having a defined length that is at least as long as the cranium's thickness, but less than a thickness that would cause the first conductive screw to invade the brain when implanted into the cranium;

   b. a second conductive skull screw, the second conductive skull screw capable of being implanted in the cranium and under the scalp, the second conductive skull screw having a defined length that is longer than the cranium's thickness, but less than a thickness that would cause the second conductive screw to invade the brain when implanted into the cranium;

c. a first surface electrode that is placed on the scalp above the first conductive skull screw;

d. a second surface electrode that is placed on the scalp above the second conductive skull screw; and

e. an amplifier electrically coupled to the first surface electrode and to the second surface electrode, the amplifier capable of detecting a differential potential between the first surface electrode and the second surface electrode, thereby generating a signal representative thereof, and capable of transmitting the signal to the processing device.

5. The apparatus of Claim 4, wherein the first conductive skull screw and the second conductive skull screw comprise stainless steel.

6. A method for communicating a neural signal inside a brain to a remote receiver, comprising the steps of:

a. inserting a first conductive skull screw in a cranium under a scalp in a first location;

b. inserting a second conductive skull screw in a cranium under the scalp in a second location, the first location and the second location chosen so that a change in neural electrical potential between the first conductive skull screw and the second conductive skull screw occurs when a patient performs a neural task;

c. implanting a transponder under the scalp, the transponder being electrically coupled to the first conductive skull screw and to the second conductive skull screw;

d. detecting the change in neural electrical potential between the first conductive skull screw and the second conductive skull screw; and

e. transmitting a signal representative of the change in neural electrical potential from the transponder to the remote receiver.

7. The method of Claim 6, further comprising the step of amplifying the differential potential before the transmitting step.

8. The method of Claim 6, further comprising the steps of powering a transponder used to transmit the signal with a power induction circuit.

9. A method for communicating a neural signal inside a brain of a patient to a remote receiver, comprising the steps of:

a. inserting a first conductive skull screw in a cranium under a scalp in a first location adjacent to a first location;

b. inserting a second conductive skull screw in a cranium under the scalp in a second location, the first location and the second location chosen so that a change in neural electrical potential between the first conductive skull screw and the second conductive skull screw occurs when a patient performs a neural task;

c. placing a first surface electrode on the scalp and above the first conductive skull screw;

d. placing a second surface electrode on the scalp and above the second conductive skull screw;

e. electrically coupling the first surface electrode and the second surface electrode to an amplifier;

f. detecting a differential electrical potential between the first surface electrode and the second surface electrode, wherein the differential electrical potential represents the neural signal; and

g. transferring a signal corresponding to the differential electrical potential to a signal processor.

10. The method of Claim 9, further comprising the step of amplifying the differential potential before the transferring step.